

8



Lesson Exemplar for Mathematics

Quarter 1

Lesson

7

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Lesson Exemplar for Mathematics Grade 8

Quarter 1: Lesson 7 (Week 7)

SY 2025-2026

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MATHEMATICS / QUARTER 1 / GRADE 8

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES

A. Content Standards	The learners should have knowledge and understanding of rational algebraic expressions and equations.
B. Performance Standards	By the end of the lesson, the learners are able to simplify, and operate with, rational algebraic expressions and solve simple rational algebraic equations. (NA)
C. Learning Competencies and Objectives	Learning Competency By the end of the lesson, the learners are able to: - simplify rational algebraic expressions. - perform operations on rational algebraic expressions. - solve problems involving simple rational algebraic equations (using cross-multiplication). Lesson Objectives - Accurately multiply and divide similar rational algebraic expressions. - Accurately multiply and divide dissimilar rational algebraic expressions. - Correctly solve problems involving rational algebraic expressions.
D. Content	- Multiplication and Division of Rational Algebraic Expressions. - Solving Problems Involving Simple Rational Algebraic Expressions.
E. Integration	

II. LEARNING RESOURCES

Green e-Math (2024, June 4). Multiplying and Dividing Rational Expressions Practice Test.
https://www.greenemath.com/College_Algebra/23/Multiplying-and-Dividing-Rational-ExpressionsPracticeTest.html

Khan Academy (2024, June 5). Operations with Rational Expressions Lesson. <https://www.khanacademy.org/test-prep/v2-sat-math/x0fcc98a58ba3bea7:advanced-math-easier/x0fcc98a58ba3bea7:operations-with-rational-expressions-easier/a/v2-sat-lesson-operations-with-rational-expressions>

Kuta Software (2024, June 5). Multiplying Rational Expressions.
<https://cdn.kutasoftware.com/Worksheets/Alg1/Multiplying%20Rational%20Expressions.pdf>

Lumen Learning (2024, June 4). Multiplying and Dividing Rational Expressions.
<https://courses.lumenlearning.com/waymakercollegealgebra/chapter/multiplying-and-dividing-rational-expressions/>

Scaffolded Math and Science (2024, June 3). Simplifying Rational Expressions. <https://www.scaffoldedmath.com/2016/06/graphing-rational-functions-reference.html>

Teachers Pay Teachers (2024, June 3). Multiplying Fractions Graphic Organizer.

<https://www.teacherspayteachers.com/Product/Multiplying-Fractions-Graphic-Organizer-1911404>

III. TEACHING AND LEARNING PROCEDURE

NOTES TO TEACHERS

A. Activating Prior Knowledge

DAY 1

1. Short Review

Steps 123! Present this activity to learners to activate their prior knowledge. Discuss the process of multiplying fractions. Afterward, let the learners answer the short review activity.

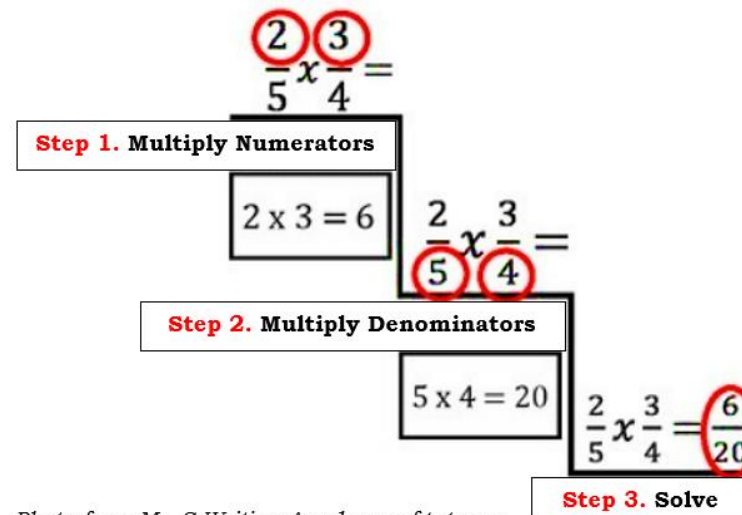


Photo from Mr. S Writing Academy of [tpt.com](https://www.tpt.com)

Fill Me In! Following “Steps 123” complete the activity below. Write your complete solutions inside the box.

1.	2.	3.	4.
$\frac{1}{6} \times \frac{1}{5} =$	$\frac{2}{5} \times \frac{2}{9} =$	$\times \frac{7}{6} = \frac{2}{3}$	$\frac{10}{3} \times \frac{1}{20} =$

DAY 1 Time Frame

15 minutes – Review Activity
15 minutes – discussion
15 minutes – lesson activity
10 minutes – feedback and Q&A

Note: Time frames are just suggestions it is up to the teacher if he/she will make it more flexible. (situation based)

Introduce the lesson by giving the learner a short review on the first day. Use the “Steps 123” activity to recall/activate learners’ prior knowledge.

After the discussion, the teacher will use the “Fill Me In” activity to check the readiness of the learners for this lesson.

Guide the learners in this activity by giving clarifications of the activity instructions.

This activity may also be used as a group task to promote a

	<table><tr><td>Solution:</td><td>Solution:</td><td>Solution:</td><td>Solution:</td></tr><tr><td colspan="4">Can you write something here?</td></tr></table>	Solution:	Solution:	Solution:	Solution:	Can you write something here?				collaborative approach in the class. After the activity, give short feedback so that the learners will know and understand why they are having that activity. Before proceeding to lesson proper, ask some questions that will link to the main lesson.
Solution:	Solution:	Solution:	Solution:							
Can you write something here?										
	2. Feedback (Optional)									
B. Establishing Lesson Purpose	1. Lesson Purpose Essential Questions - How will you multiply or divide rational algebraic expressions? - How will you apply the principles/concepts of multiplication of rational algebraic expressions in real-life scenarios? 2. Unlocking Content Vocabulary In multiplying rational algebraic expressions, multiply the numerators and the denominators of the two rational algebraic expressions. In dividing rational algebraic expressions, get the reciprocal of the divisor and then proceed to multiply the two rational algebraic expressions. Graphic Organizer Analogy Use this graphic organizer as a connecting review activity for the introduction of the main lesson. By presenting this graphic organizer, you will be able to relate the concept of multiplying and dividing rational algebraic expressions.	Operations on Rational Algebraic Fractions (Multiplying and Dividing) <pre>graph TD; A["1 Factor"] -- "add & subtract" --> B["Create a common denominator"]; A -- "multiply" --> C["Cancel factors"]; A -- "divide" --> D["Keep, change, flip"]; B --> E["Simplify numerator, Keep denominator"]; E --> F["Set restrictions"]; C --> G["Multiply across"]; G --> F;</pre> <i>Photo from scaffoldedmath.blogs.com</i>	For the lesson purpose, you will introduce the lesson and discuss its importance using essential/guide question/s. Note: Essential questions are not necessary to be answered in this part. These questions will be answered in part of “learners’ takeaways.” Guide the learners to unlock content vocabulary using the prepared activity. Let the learners share their ideas based on what they saw in the picture.							

C. Developing and Deepening Understanding

SUB-TOPIC 1: Multiplication and Subtraction of Rational Algebraic Expression

1. Explicitation

Multiplying Rational Algebraic Expressions

To multiply rational algebraic expressions, multiply the numerators together and the denominators together.

Dividing Rational Algebraic Expressions

To divide rational algebraic expressions, take the reciprocal of the divisor and then multiply the resulting expressions.

2. Worked Example

1. Perform the indicated operation. $\frac{3x^2y^3}{z^4} \cdot \frac{5z^6}{6xy}$

Solution:

Step 1

Factor the numerator and denominator of each rational algebraic expression then cancel the common factors.

$$\frac{3 \cdot \cancel{x \cdot x} \cdot y \cdot y \cdot y}{\cancel{z \cdot z \cdot z \cdot z}} \cdot \frac{5 \cdot \cancel{z \cdot z \cdot z \cdot z \cdot z \cdot z}}{2 \cdot 3 \cdot \cancel{x} \cdot y}$$

$$= \frac{x \cdot y \cdot y}{1} \cdot \frac{5 \cdot z \cdot z}{2}$$

Step 2

Simplify the remaining expressions by multiplying.

$$\frac{x \cdot y \cdot y \cdot 5 \cdot z \cdot z}{2} = \frac{5xy^2z^2}{2}$$

Therefore,

$$\frac{3x^2y^3}{z^4} \cdot \frac{5z^6}{6xy} = \frac{5xy^2z^2}{2}$$



Photo Source: ehamall.com

2. Divide the rational algebraic expression and simplify if possible $\frac{x^2-8x+7}{x^2-4} \div \frac{x^2+x-2}{x^2+2x-8}$

Solution:

Step 1

Get the reciprocal of the divisor and change the division sign to multiplication.

$$\frac{x^2-8x+7}{x^2-4} \cdot \frac{x^2+2x-8}{x^2+x-2}$$

↓ ↓

Using the graphic organizer, before this discussing the secondary let the learners illustrate the secondary data “Compare Me” activity.

Process and validate the answer of learners then continue with the lesson proper.

For the explicitation, present this activity to the learners to gather some information they got from the “Compare Me” activity.

Write all responses below and collect all ideas that would hit the sub-topic.

Afterwards proceed to lesson proper and use the worked examples for elaboration of the lesson topic and for better understanding of the concept.

The teacher may also add more activities for further elaboration of the lesson. (If necessary)

Step 2

Factor the numerator and denominator of each rational algebraic expression. Then cancel the common factors.

$$\frac{\cancel{(x-1)}(x-7) \cdot \cancel{(x-2)}(x+4)}{(x+2)\cancel{(x-2)} \cdot \cancel{(x-1)}(x+2)} = \frac{(x-7)(x+4)}{(x+2)(x+2)}$$

Step 3

Simplify the remaining expressions by multiplications.

$$\frac{(x-7)(x+4)}{(x+2)(x+2)} = \frac{x^2 - 3x - 28}{x^2 + 4x + 4}$$

Therefore,

$$\frac{x^2 - 8x + 7}{x^2 - 4} \div \frac{x^2 + x - 2}{x^2 + 2x - 8} = \frac{x^2 - 3x - 28}{x^2 + 4x + 4}$$

DAY 2**Problem Solving Involving Rational Algebraic Expression.**

3. Marites walked 3 km to her friend's house and returned home on a bike. She averages 4 km per hour faster when cycling than when walking. The total time for both trips is two hours. Find her walking speed.

Solution: Let w represent Marites walking speed, and $w + 4$ or her cycling speed. The problem is linked to a distance problem. Then we use $d = rt$. To find time, we have, $t = \frac{d}{r}$. The time walking is given by $\frac{3}{w}$ and time for cycling is $\frac{3}{w+4}$.

From the information above we write the working equation as, $\frac{3}{w} + \frac{3}{w+4} = 2$. Solve for w .

First, we need to find the LCD to be multiplied to both sides of the equation. Since the denominators of the rational expressions are not similar, we will multiply the two denominators. Hence, the LCD is $w(w + 4)$.

$$\text{So, } w(w + 4) \left(\frac{3}{w} + \frac{3}{w+4} \right) = 2w(w + 4)$$

$$3(w + 4) + 3w = 2w(w + 4)$$

$$3w + 12 + 3w = 2w^2 + 8w$$

$$0 = 2w^2 + 2w - 12$$

$$0 = 2(w^2 + w - 6)$$

$$0 = 2(w + 3)(w - 2)$$

$$w = -3, w = 2$$

With the two results, we will discard the negative answer.

Thus, the walking speed is 2kph.

DAY 2 Time Frame

5 minutes – review from day 1
25 minutes – discussion
35 minutes – lesson activity
and giving feedback

3. Lesson Activity

A. Multiply the rational algebraic expressions and simplify if possible.

1. $\frac{9r^3 - 54r^2}{9r^2 + 45r} \cdot \frac{9r^2 + 9r}{9r^3 - 54r^2}$	2. $\frac{5r + 50}{r + 10} \cdot \frac{r - 2}{5}$
Solution:	Solution:
Teacher's feedback:	

B. Divide the rational algebraic expressions and simplify your answers if possible.

1. $\frac{3}{28b} \div \frac{3}{b+1}$	2. $\frac{4n}{n-6} \div \frac{4n}{8n-48}$
Solution:	Solution:
Teacher's feedback:	

C. Solve the problem below completely.

Working together, Empoy and Bitoy painted a house wall in 8 hours. A year ago, Empoy painted the house wall by himself. The year before, Bitoy painted it by himself but took 12 hours less than Empoy took. How long did Empoy and Bitoy take when each was painting alone?
Solution:

D. Making Generalizations**DAY 3****1. Learners' Takeaways**

- How will you multiply or divide rational algebraic expressions?
- How will you apply the principles/concepts of multiplying rational algebraic expressions in real-life scenarios?

DAY 3 Time Frame

15 minutes –giving feedback on the lesson activity from Day 2
 20 minutes – lesson discussion

	2. Reflection on Learning Ask the learners to write a short essay reflecting their experience in learning the lesson and applying the concepts in real-world situations.	To identify learners' takeaways, let the learners create their own scenarios by applying the concept of multiplying and dividing rational algebraic expressions. Have the learners share their scenarios in class and provide feedback. 15 – minutes lesson reflections 5 – minutes wrap up.
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IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION			NOTES TO TEACHERS
A. Evaluating Learning	DAY 4		
	1. Formative Assessment		
	A. Perform the following operations as indicated.		
	1. $\frac{n-1}{8n^2} \cdot \frac{8n^2}{6n^3+48n^2}$	2. $\frac{x^2-2x+1}{x+1} \div \frac{7x-7}{x+1}$	3. $\frac{k^2-36}{48-2k-k^2} \cdot \frac{k+8}{k-3}$
	Solution:	Solution:	Solution:
	4. $\frac{2n+2}{n+1} \div \frac{2}{n-6}$	5. $\frac{v+3}{v+2} \div \frac{8v^2}{8v^3+16v^2}$	6. $\frac{1}{m-1} \cdot \frac{8m^2+56m}{m^2+13m+42}$
	Solution:	Solution:	Solution:
Teacher's Feedback:			
	DAY 4 Time Frame giving instructions. 30 – minutes formative assessment. 25 – minutes checking of answers and rationalization of answers. Formative Assessment A. Answer Key: 1. $\frac{n-1}{6n^2(n+8)}$ 2. $\frac{x-1}{7}$ 3. $\frac{(k+6)}{k-3}$		

B. Problem Solving: Solve the following problems completely.

1. Tsikoy can swim at a speed of 5 kph in calm water. The time it takes him to swim 4 kilometers upstream is the same as the time it takes to swim 16 kilometers downstream. What is the speed of the current?

Solution:

$d = rt$	Distances	Rate	Time
Upstream			
Downstream			

2. A boat travels 240 kilometers downstream in the same amount of time it takes to travel 160 kilometers upstream. The current's speed is 5 miles per hour. What is the boat's speed in still water?

Solution:

$d = rt$	Distances	Rate	Time
Upstream			
Downstream			

3. An airplane flies 910 kilometers with the wind in the same time it takes to travel 660 kilometers against the wind. The airplane's speed in still air is 305kph. What is the wind's speed?

Solution:

$d = rt$	Distances	Rate	Time
Against the wind			
With the wind			

2. Homework (Optional)

Perform the indicated operation.

1. $\frac{59n}{99} \cdot \frac{80}{33n}$	2. $\frac{7n^2(n+4)}{(n-3)(n+4)} \cdot \frac{n-3}{(n+8)(n+6)}$	3. $\frac{2n+2}{n+1} \div \frac{2}{n-6}$
Solution:	Solution:	Solution:
Teacher's Feedback:		

4. $n - 6$

5. $v + 3$

6.
$$\frac{8m}{(m-1)(m+6)}$$

Formative Assessment B. Answer Key:

- 3kph
- 25 kph
- 48.6 kph

Homework Answer Key:

- $\frac{4720}{3267}$
- $\frac{7n^2}{(n+6)(n+8)}$
- $n - 6$

B. Teacher's Remarks	<i>Note observations on any of the following areas:</i>	Effective Practices	Problems Encountered	The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement, and other related stuff. Teachers may also suggest ways to improve the different activities explored/lesson exemplar.
	strategies explored			
	materials used			
	learner engagement/ interaction			
	others			
C. Teacher's Reflection	<i>Reflection guide or prompt can be on:</i> • <u>principles behind the teaching</u> What principles and beliefs informed my lesson? Why did I teach the lesson the way I did? • <u>students</u> What roles did my students play in my lesson? What did my students learn? How did they learn? • <u>ways forward</u> What could I have done differently? What can I explore in the next lesson?			Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.